George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

OWI-ED23-002
10/4/99
Baseline

ORGANIZATIONAL WORK INSTRUCTION

STRUCTURAL DESIGN GROUP
ED23

RESEARCH AND TECHNOLOGY DESIGN (NON-FLIGHT)

APPROVING AUTHORITY:

NAME	TITLE	ORG	DATE
Sid Rowe	Group Leader	ED23	10/4/99

CHECK THE MASTERLIST,
http://masterlist.msfc.nasa.gov/ed/
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Instructions
Baseline		10/4/99	

1. SCOPE.

1.1 Scope. This Organizational Work Instruction (OWI) defines the methods and procedures used at Marshall Space Flight Center (MSFC) to design structural and experimental research and technology hardware that meets ANSI/ASK Q9001-1994 requirements.

1.2 Purpose. This OWI establishes the process for design of research and technology hardware that may evolve into components for: advanced vehicles, spacecraft, payloads, experiments, pyrotechnic devices for separation/range safety, and mechanical and propulsion subsystems; including traditional and advanced meteoroid/orbital debris protection systems for space vehicles. Implementation of this OWI will ensure that the design meets the design requirements and the MSFC Quality Manual, MPD 1280.1, requirements.

1.3 Applicability. This OWI applies to non-flight research and technology design work done at MSFC by Structural Design Group (ED23) personnel and by contractors for ED23.

2. APPLICABLE DOCUMENTS.

ANSI/ASQC Q9001-1994	Quality Systems-Model for Quality Assurance in Design, Development, Production, Installation, and Servicing
MPD 1280.1	MSFC Management Manual (MMM)
MPG-8060.1	Design Control
MPG 1410.1	Document and Data Control for Organizational Issuance
MSFC-P08.1	Product Identification
MSFC-STD-555	MSFC Engineering Documentation Standard
MSFC-MNL-2348	Specifications and Standards Approved Baseline List.
OWI-ED20-001	Structures and Dynamics Laboratory Quality Maintenance Processes

3. DEFINITIONS.

3.1 Definitions of Terms:

Centerwide Work Instructions (CWI): Centerwide Work Instructions are **Level 3 documents** that provide step-by-step directions to perform specific duties that apply to all center organizations.

Customer: The recipient of a product or service provided by the Marshall Space Flight Center.

Master List: A controlled list of those currently approved organizational work instructions.

MSFC Quality Manual (MQM): The **Level 1 document** that defines the Marshall Space Flight Center's policy and commitment to quality.

MSFC Standard Procedures (MSP): **Level 2 documents** that describe how Marshall Space Flight Center will implement each of the elements of ISO-9001. A particular Marshall Standard Procedure defines MSFC's organizational relationships and responsibilities for implementing a particular portion of ISO-9001, describing what's to be done, where its done, and by whom its done.

Organizational Work Instructions (OWI): Organizational Work Instructions are **Level 4 documents** that provide step-by-step directions to perform specific duties that apply to one or more MSFC organizations, but not to all MSFC organizations.

Quality Records: Documentation furnishing objective evidence of activities performed or results achieved which substantiates that work has been completed in fulfillment of specified customer and/or organizational requirements.

3.2 Acronym Definitions:

CWI: Centerwide Work Instructions

EO: Engineering Order

EPL: Engineering Parts List

DCC: Document Control Custodian

MLC: Master List Custodian

MQM: MSFC Quality Manual

MSP: MSFC Standard Procedure

OPR: Office of Primary Responsibility

OWI: Organizational Work Instruction

R&T: Research and Technology

4. INSTRUCTION:

4.1 Accepting and Documenting New Work. Acceptance of new work and work flow internal to ED23 group shall be in accordance with ED20-OWI-001.

4.2 Requirements Development. When applicable, ED23 personnel shall interactively obtain design requirements from the customer.

4.3 Design Development. ED23 will evaluate all design requirements and develop conceptual design(s). ED23 in concert with the customer (using inputs from: analysis, manufacturing, and materials personnel when needed) selects or recommends the concept that best meets the design requirements. Design development is performed by following steps 4.2 through 4.9.

4.4 Design Consultation. ED23 consults with other technical experts from venders, other NASA centers, other civil service agencies, and contractors as the designer deems necessary to facilitate concept development. Design consultation is an iterative process; the designer consults with sources until the hardware is fabricated.

4.5 Analysis.

4.5.1 Analysis and Materials Consultation. ED23 consults with the different analysis groups, (stress, dynamics, thermal, and materials selection) as deemed necessary by the designer in agreement with the responsible team lead to obtain concurrence on the design. For example the designer and team lead may agree to not have a stress engineer analyze a design that has no stress/loads issue. Analysis consultation is an iterative process; the designer continually consults with the assigned analysts until sign off.

4.5.2 Analysis Code Evaluation. ED23 developed analysis codes will be functionally tested on their respective platforms using test cases sufficient to satisfy the *user* that the code is performing properly. The engineering drawings, developed as a

result of sizing structural elements, components and assemblies using information from these analysis codes, are submitted to team and group level management for review and approval at sign off.

4.6 Customer Review. ED23 provides the customer a design review sufficient to satisfy the customer that the design will meet the intent/requirements and functionality agreed to with the customer. This informal review will be held before submitting drawings for fabrication. Support documentation can include the development of drawings, sketches, design analysis, view graphs, and presentations. Support documentation that is not released through the MSFC Documentation Repository is filed by the originator as reference documentation.

4.7 Producibility Inputs. If the designer and team lead determines it appropriate, then ED23 will consult the Materials Processes & Manufacturing department and or Fabrication personnel for a producibility review of preliminary drawings or concepts for producibility related changes/options to be incorporated into the final design.

4.8 Product I.D.

4.8.1 Product I.D. ED23 establishes and documents part, sub assembly, and/or assembly identification methodology per customer and team lead via MPG 8040.2 and MSFC-STD-555. In selecting the identification method (if used) ED23 accounts for the following as applicable: part or assembly usage, part location within assembly, part proximity to optics for offgassing concerns.

4.9 Document Design. ED23 personnel documents the design using drawings and MSFC-STD-555 as a guide to prepare drawings. ED23 may “tailor” the design documentation for the scope or size of the project.

4.10 Release. ED23 informally releases R. & T. documentation to be fabricated using MSFC-STD-555 as a guide. MSFC-MNL-2348 “Specifications and Standards Approved Baseline List” is a useful document for choosing applicable specifications. The drawing release cycle will verify proper use of specifications and the signatures on the drawing will approve the use of those specifications. ED23 engineers and designers maintain individual files of design calculations and reference material. These data are controlled by each employee. The final analyses (where performed) by supporting disciplines (stress, thermal, materials, etc.) are validated by the approval signatures on the released

drawings. In cases where engineering calculations are performed that are not reflected on released drawings, the individual engineer's calculations are validated by the appropriate team lead and/or group chief. The team lead/group chief will assure that proper interfaces with the appropriate disciplines have been performed.

To **release** the **R. & T.** work for fabrication the designer obtains an **approval signature from the responsible team lead.** If the size and scope of the project warrants, the team lead has the option of requiring the designer to obtain a second signature such as: the group lead, group lead designee, or another team lead.

If the designer *is* a team lead, the release signature should be the group lead, group lead designee, or another team lead.

In the case of a preliminary trial part drawing such as: a pre production manufacturing process development unit, a signature is not necessary unless the responsible team lead deems it so.

4.11 Support Fabrication/Procurement. ED23 submits fabrication requests to have hardware built and assists civil service and contractor fabricators with issues dealing with ED23 hardware. These issues include Basic Ordering Agreements (BOA) procurement, material substitution, vendor information, hardware non-conformance, etc.

4.12 Design Changes.

4.12.1 Design Changes as required. ED23 releases necessary documentation using MSFC-STD-555 as a guide to facilitate changes as required during the course of the project. Changes to ED23 R. & T. documentation are initiated by the designer incorporating the next higher revision letter and obtaining a concurrence signature from the team lead or group lead/designee. It will not be *necessary* to use an E.O., however the designer may use E.O.'s in the traditional way if they prefer.

4.12.2 Redline Changes. In the case where "redlining" a drawing is necessary to avoid interrupting fabrication, the designer may redline a change on the shop drawing(s) and sign and date the redline. The designer must then update the appropriate CAD files to reflect the changes in order to maintain configuration control. The designer then has the option of 1. leaving the redlined drawing(s) with fabrication personnel, or 2. revising the drawing as in section 4.12.1 above.

4.13 Support Testing/Product Delivery. ED23 provides support during the testing and product delivery phase of the project per the task agreements.

4.14 Data Control. During the design phase of a project each designer maintains their CAD, CAE, and other supporting files, and ensures their correctness and proper usage for the intended design. After completion/termination of the project the ED23 System Manager archives electronic CAD and CAE data generated by ED23.

5. NOTES. None.

6. SAFETY PRECAUTIONS AND WARNING NOTES. N/A

7. APPENDICES, DATA, REPORTS, AND FORMS. None.

8. QUALITY RECORDS.

8.1 Quality Record Types. ED23 generates the following quality records for R. & T. design:

Record Type	Location
Drawings	ED23
Engineering Parts Lists (EPL)	ED23
CAD & CAE Archived Files	ED23 System Manager

8.2 Quality Record Retention. Retention Schedule for ED23 R. & T. design Quality Records:

Record Type	Retention
Drawings	ED23 until completion of project.*

E.P.L.'s	ED23 until completion of project.*
CAD & CAE Archived Files	10 years, Remove and make Historical

*. After completion of the project the R. & T. design documentation will be delivered to the customer.

8.3 Quality Record Storage. To view or obtain a copy of our *current* OWI(s) or Masterlist go to the Inside Marshall intranet address:

http://masterlist.msfc.nasa.gov/ed/

This intranet address contains the "*official*" OWI documents, and Masterlists, ED23 personnel must verify any paper copy to be the latest version before using.

9. TOOLS, EQUIPMENT, AND MATERIALS. N/A

10. PERSONNEL TRAINING AND CERTIFICATION. N/A

11. FLOW DIAGRAM. The following is a representative work flow diagram.

R & T DESIGN WORK FLOW DIAGRAM